Technische Universität München
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Theoretical Computer Science

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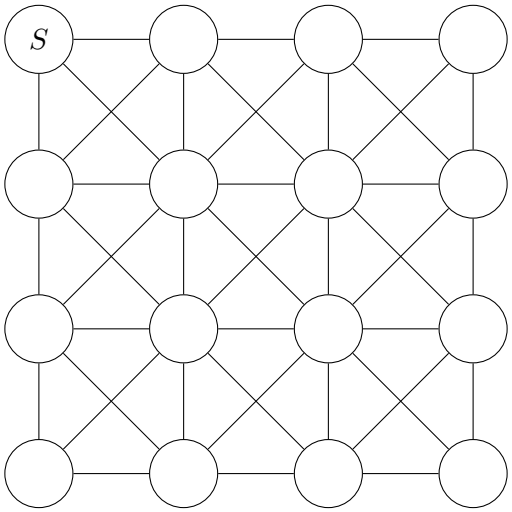
# Fundamental Algorithms 10

## Exercise 1 (Modified Graph Traversal)

Consider the modified traversal algorithm for graphs and trees ModTrav.

**Algorithm 1:** ModTrav

```
Input: V: Node
       visit: Visit function
mark[V.key] ← 1;
act ← []; // Local queue of active nodes
for (v, w) ∈ V.edges do
    if mark[W.key] = 0 then
        visit(W); // Visit unmarked node W
        act ← act ∘ W;
    end
end
for W ∈ act do ModTrav(W);
```




1. Given the graph above, in which order are nodes visited by this algorithm? Number the nodes accordingly. The outgoing edges in $V$.edges are stored clockwise.
2. In the same graph, mark the edges that are part of the spanning tree computed by the algorithm.
3. Now assume that the second for-loop is changed into a parallel loop. Discuss whether there can be concurrent read or write access to the elements of the array *mark*. Think about what happens if the graph is a tree.